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The UK Market for Norwegian Gas: An Energy Security Issue

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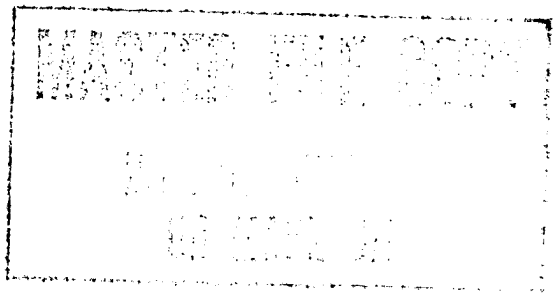
An Intelligence Assessment



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An Intelligence Assessment

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Office of Global Issues. Comments and queries are welcome and may be directed to the Chief, Energy Issues Branch, OGI,

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Key Judgments

Information available as of 1 March 1983 was used in this report.

Despite sharp reductions in industry forecasts of the United Kingdom's gas requirements, the UK will need additional Norwegian gas in the early 1990s, and we expect London to compete aggressively with continental European purchasers for gas from Norway's Sleipner field. The UK and continental gas markets are physically separate, and gas industry economics dictate that a successful bid by either would cause the bulk of Sleipner gas to be available to that market only.

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If the British win the bidding—as we now expect—and pursue a more aggressive domestic gas development policy, we estimate that they could have a small surplus of natural gas available for export to the Continent by the mid-1990s. The existence of a surplus raises the possibility of a pipeline link to export gas to the Continent. such a link would increase energy security in the West European gas market by reducing the Continent's reliance on Soviet supplies.

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A number of political constraints must be overcome, however, before a link to the Continent can occur:

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- The British fear that UK gas reserves would be rapidly depleted by the Continent.
- There is still much concern about balances of supply and demand at the turn of the century, when—according to official estimates—currently identified reserves could be inadequate to meet domestic requirements.
- The Norwegians oppose an integrated West European gas market, which would lessen competition for their gas exports. The British appear reluctant to antagonize the Norwegians on the issue of a pipeline link because of the uncertainty about future Norwegian gas sales to the UK.

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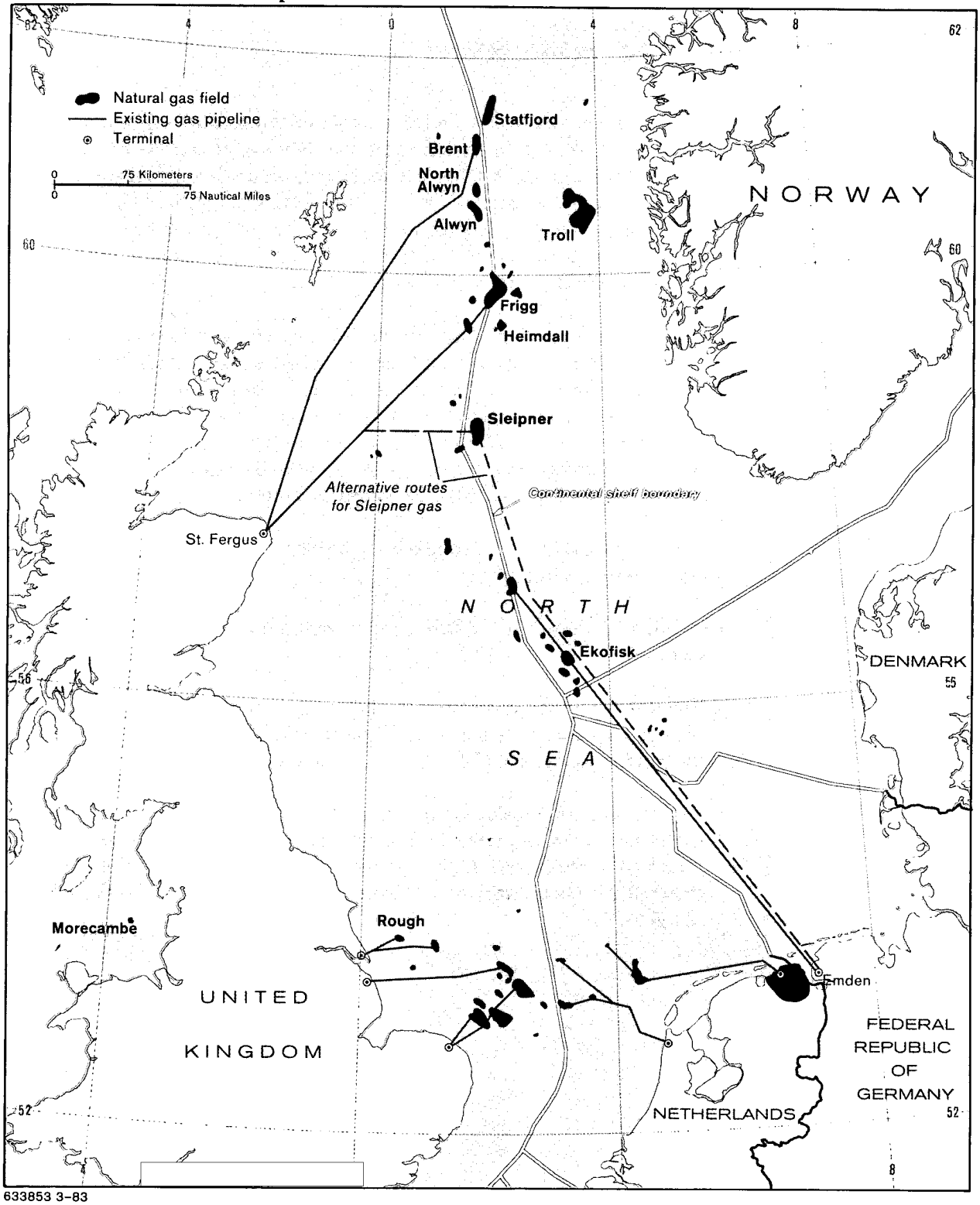
North Sea Gasfields and Pipelines



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Introduction

The West European gas market is separated into two distinct segments, the United Kingdom and the Continent. Even though the two are geographically close, the absence of an interconnecting pipeline makes them separate. As a result, the two markets compete for Norwegian gas, and both expect Norway to provide additional secure, stable gas supplies in the 1990s.

Norway has two large gasfields that it plans to develop after 1990:

- The Sleipner field will produce about 330,000 barrels per day oil equivalent (bdoe) in the early 1990s—one-half the capacity of the Soviet pipeline now under construction.
- The much larger Troll field, which will be capable of producing about 650,000 bdoe after 1995.

Economics of the gas industry dictate that virtually all of the Sleipner field be delivered to only one market.[1] As a result, if the UK bids successfully for Sleipner gas, little if any gas would be available for the Continent to enhance its overall energy security. With the acquisition of Sleipner gas, however, the United Kingdom might wind up with an excess. This would reduce UK needs for Troll gas and could encourage London to consider a pipeline link with the Continent to export some of the surplus. Such a link would enhance the gas supply flexibility of both European gas markets.

[1] The high capital costs associated with the construction of a gas transmission system and the cost of transporting the gas over long distances require that a high flow rate be maintained in the pipeline if the gas is to be delivered at a competitive price. The reserves in the Sleipner field are not large enough to support construction of two separate pipelines.

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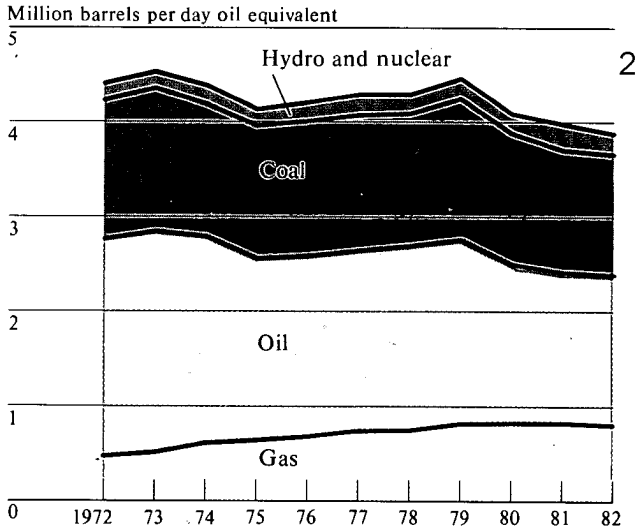
Figure 1
United Kingdom: Energy Consumption by Type of Fuel



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Recent Trends

Consumption

Recent sluggish economic growth and the impact of conservation resulting from higher energy prices have led to sharp reductions in energy consumption in the United Kingdom. Total energy consumption declined by about 3 percent annually from 1978 to 1981, falling from 4.3 to 3.9 million bdoe. Natural gas demand over this period, however, continued a trend evident since the 1960s and increased nearly 4 percent per year. Consumption rose from 750,000 bdoe in

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Table 1 *(US $ per million Btu)*
Residential Energy Prices

	Electricity	Light Fuel Oil	Natural Gas
1978	13.61	3.96	3.35
1979	14.78	5.02	3.47
1980	18.80	6.72	4.13
1981	22.60	8.21	5.10
1982	23.94	8.80	6.12

Table 2 *(US $ per million Btu)*
Residential Heating Costs [a]

	Electricity	Light Fuel Oil	Natural Gas
1978	13.61	7.92	5.58
1979	14.78	10.04	5.78
1980	18.80	13.44	6.88
1981	22.60	16.42	8.50
1982	23.94	17.60	10.20

[a] Assuming efficiencies of 1 for electric furnaces, 0.6 for gas furnaces, and 0.5 for oil furnaces.

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1978 to 835,000 bdoe [2] in 1981, when the share of natural gas in total energy consumption reached 21 percent.

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Growth in gas demand was strongest in the residential and commercial sector, which accounted for more than 60 percent of gas consumed in the United Kingdom. According to official UK statistics, gas consumption in this sector increased from 415,000 to 495,000 bdoe during the 1978-81 period, an increase of more than 6 percent per year. Consumption of all other fuels in this sector declined. Use of natural gas in the UK industrial sector also increased over this period. Gas consumption rose about 1 percent per year to 285,000 bdoe in 1981, and gas's share of the industrial market jumped from 23 to 32 percent.

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Prices

The rapid rise in the demand for gas was due primarily to the low price of gas relative to alternative fuels, especially in the residential sector. The price of natural gas to residential users in 1978-81 averaged about 65 percent of the price of light fuel oil, the closest substitute (table 1). Further, given the relative efficiencies of gas versus competing fuels in space conditioning uses, gas prices were even more advantageous.[3] According to engineering studies, the cost of heating with natural gas is about half the cost of heating with light fuel oil, and the heating advantage of natural gas over electricity is substantially greater (table 2). Because gas prices during the 1978-81 period rose only 52 percent, compared to a 107-percent rise in heating oil prices and a 66-percent increase in electricity prices, natural gas increased its significant advantage in the residential sector over all alternative fuels.

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The relative price advantage of gas to industrial users was substantially less, according to official UK price data. Residual fuel oil, the main competitor with natural gas because many large users maintain fuel-switching capability, was priced at roughly 85 percent of natural gas. Gas, however, requires no storage or handling costs and was still the choice of many large consumers. Growth in gas demand in the industrial sector was also fostered by the environmental and efficiency advantages of gas over coal or oil products. Some industrial users in the United Kingdom have recently claimed that natural gas and residual fuel oil prices are now comparable in terms of total cost and other factors (table 3).

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[2] Data converted at the rate of 1 billion cubic meters = 16,400 bdoe.

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[3] Engineering studies have shown that the heating efficiency of a new gas furnace is about 20 percent higher than that of a new oil furnace. As a result, less natural gas is required to produce the same amount of heat from an equivalent quantity of oil.

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Figure 2
United Kingdom: Residential Energy Prices

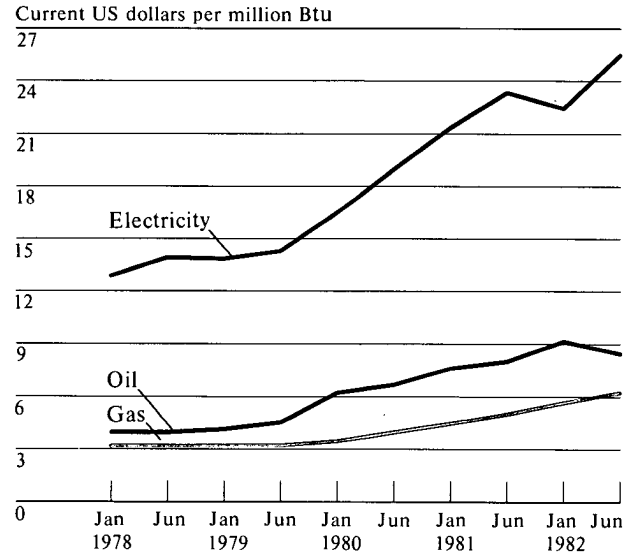
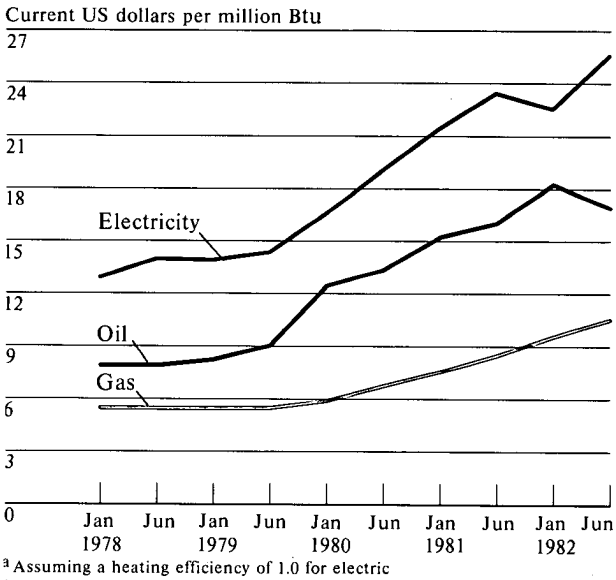


Figure 3
United Kingdom: Residental Heating Costs[a]



[a] Assuming a heating efficiency of 1.0 for electric furnaces, 0.6 for gas furnaces, and 0.5 for oil furnaces.

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Production and Import Trends

UK gas production peaked at 705,000 bdoe in 1977, then declined steadily to about 607,000 bdoe in 1981. Most of the growth in UK gas consumption was accommodated by increased production from the Frigg field in the northern North Sea. Frigg is 40-percent British and 60-percent Norwegian. Its total production increased rapidly from an initial 33,000 bdoe in 1977 to 295,000 bdoe in 1981. London had previously negotiated with Norway to purchase all of the Norwegian share of Frigg gas, and UK imports of gas from Norway increased rapidly, growing from about 20,000 bdoe in 1977 to 197,000 bdoe in 1981, nearly one-fourth of total UK consumption. The British Gas Corporation paid substantially more for Norwegian imports than they had been willing to give domestic producers. Continental buyers, however, were paying even higher prices for other Norwegian gas supplies.

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Government Price Policy

Gas prices in the United Kingdom have remained low relative to other fuels because of government policies. UK regulations implemented when North Sea gas production began in the 1960s required that all gas produced on the UK continental shelf be landed in Britain. A single buyer, the British Gas Corporation (BGC), had first refusal on all available supplies. The BGC owns the entire domestic gas distribution network and was empowered by the government to act as the sole supplier to all UK gas users. Producers were prohibited from using the gas themselves or selling to any but industrial customers should the BGC opt not to purchase all available supplies. These regulations severely limited marketing opportunities for producers and effectively guaranteed the BGC long-term access to low-cost gas supplies because prices were set by the

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Table 3 *(US $ per million Btu)*
Industrial Energy Prices

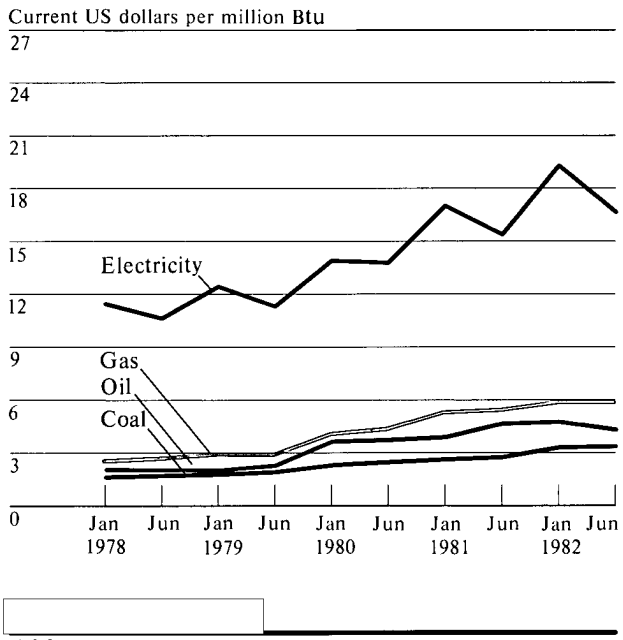
	Electricity	Natural Gas	Residual Fuel Oil	Coal
1978	11.14	2.73	2.19	1.75
1979	12.33	3.18	2.77	2.04
1980	14.31	4.54	3.90	2.52
1981	16.34	5.55	4.63	2.84
1982	18.00	5.93	4.70	3.35

BGC. As a result, the BGC was paying an average price of less than $2 per million British thermal unit (Btu) for UK gas in 1982, while continental buyers were paying about $4 per million Btu for Norwegian and other gas supplies.

Intent on increasing domestic and industrial market shares and encouraging substitution from oil to gas, the BGC consistently maintained domestic consumer gas prices far below market rates, a feat possible only because of the BGC's extremely low acquisition cost. According to the International Energy Agency (IEA), industrial gas prices in the UK in 1981 were 80 percent of prices paid by industrial users on the Continent, and UK residential gas prices were about half those paid by other European consumers. UK gas producers argued vigorously that such low prices could not provide the additional investment required to increase or even to maintain domestic gas production. Still, as sole purchaser, the BGC was able to maintain its "cost plus reasonable profit" pricing policies until 1981. Frigg gas production, however, peaked in 1981, and the BGC has recently been forced to renegotiate producer price agreements to spur the additional production needed to help meet projected increases in gas demand.

A number of additional UK North Sea projects have recently been undertaken because of these price increases. They will not, however, nearly match the projected growth in gas consumption. As a result, the BGC has developed a new sense of urgency about assuring additional gas supplies. The UK Government has also reacted to this changing environment by

Figure 4
United Kingdom: Industrial Energy Prices



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implementing policies designed to moderate growth in gas demand; in 1981, for example, London instructed the BGC to raise real residential gas prices by 10 percent per year from 1981 to 1983. As a result of this change and the slippage in crude oil prices, the large price difference between the two fuels in the residential and commercial sector has narrowed.

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Gas Demand Outlook

Projections

Industry forecasts prepared in the first half of 1982 projected growth in UK gas demand to 1995 at 2 to 3 percent per year. These forecasts for 1985 range from 870,000 to 900,000 bdoe, and as high as 1.1 mbdoe by 1995.

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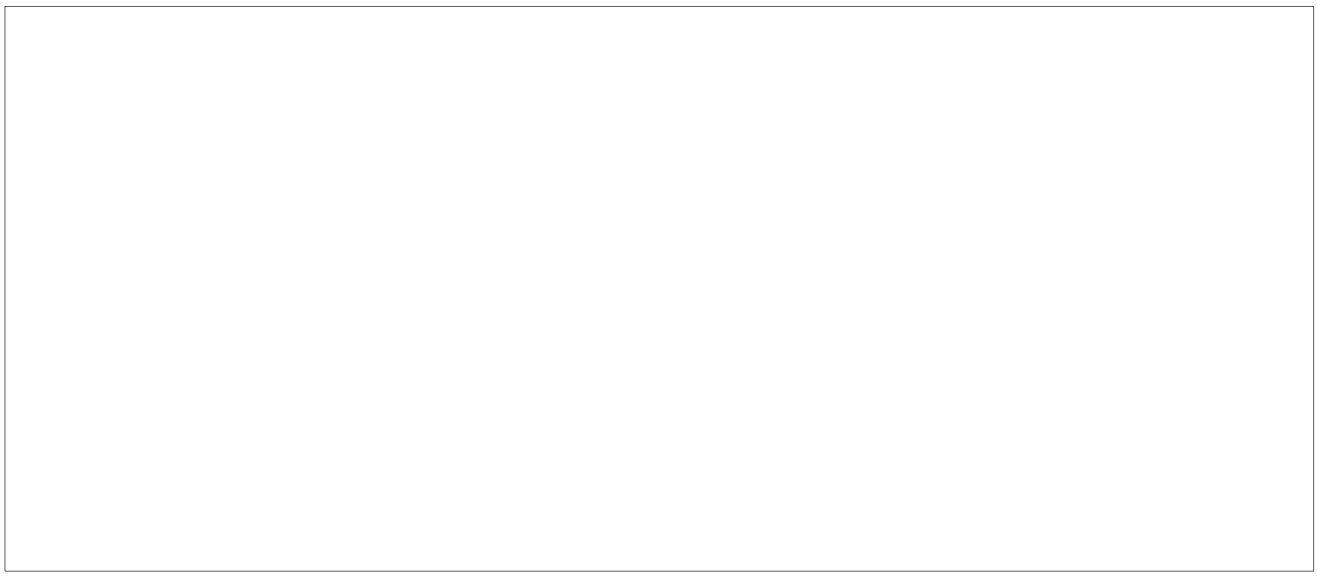

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Changes in those factors that in earlier years favored rapid growth in gas demand—low relative prices, security of supply, and government policies—will slow gas demand growth in the 1980s:

- Declining real oil prices, expected until 1985, will increase the price of gas relative to oil.
- North Sea gas supplies will be subject to increasing cost and competition from continental users.
- Government policies no longer encourage artificially low gas prices.
- Projections indicating only moderate UK economic growth do not support forecasts of continued high growth in gas consumption.

If nominal oil prices decline, as we now expect, the relative price advantage of gas will erode rapidly, virtually ending growth in gas consumption in the industrial sector and moderating consumption growth in the residential and commercial sectors. Although stronger economic growth could spur gas consumption, the higher cost of bringing new gas reserves into production would raise prices and have a dampening effect on demand growth.

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Gas Reserves and Production

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The 1982 *Brown Book,* the official UK report on the development of British oil and gas resources, estimates remaining proved and probable gas reserves at about 6 billion barrels of oil equivalent (boe), almost half of which lie in the southern sector of the North Sea. In addition, the official UK estimate for potential undiscovered (possible) reserves ranges from 40 million to 4 billion boe for a total of 6.4 to 10 billion boe maximum recoverable reserves.[4]

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[4] Maximum recoverable (potential) reserves include proved, probable, and possible reserves.

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[redacted]

[redacted] In our judgment, official statistics underestimate remaining recoverable gas reserves on the UK continental shelf, and London will make concessions on tax and pricing policies that will allow domestic production to rise well above official estimates. [redacted]

London has already taken steps to spur additional production:

- Prices paid by the BGC to domestic gas producers are increasing. Last October the BGC signed a contract with operators of the North Alwyn gasfield to pay $4 per million Btu, the highest price ever paid for domestic gas.

- The eighth licensing round, currently under way, includes 38 southern-sector fields with gas potential. Although overall response to the 184 blocks on offer has been disappointing, companies have concentrated their bids on the possible gas-producing concessions.

- The Oil and Gas Bill of 1982 will end the BGC's monopoly as sole supplier to the industrial sector and large commercial users, allowing them to contract directly with alternative gas suppliers.

These moves probably will increase domestic gas production to about 820,000 bdoe by 1990 and to 830,000 to 900,000 bdoe in 1995. [redacted] 25X1

Balancing Gas Needs: The 1980s

On the basis of our assessment of gas availability and potential production, we believe that the United Kingdom will need to import between 165,000 and 240,000 bdoe of natural gas through 1990. Most of this requirement will be met from the Norwegian share of Frigg. The British, however, might require small incremental amounts of gas to meet peak-load demand: 25X1

- Any incremental requirement probably will be met with liquid natural gas (LNG) imports from Algeria. The BGC has imported Algerian LNG in the past and has the necessary import infrastructure.
- Additional peak production capacity may be developed in the Morecambe field. Plans are in place to expand gas storage capacity in the Rough field.
- The BGC is also trying to conserve gas from domestic fields by discontinuing service to "nonpremium" industrial users, who were formerly served on an interruptible basis. 25X1

We believe the UK will be able, with these measures, to meet domestic gas demand until the end of the decade without additional imports, and may even have a small volume of excess gas in the late 1980s. 25X1

[redacted] 25X1

Looking Into the 1990s

According to official government projections, however, Norwegian Frigg production will decline rapidly after 1990, falling from about 200,000 bdoe in 1990 to zero in 1993. Since UK gas consumption will continue to grow, reaching 930,000 to 1 million bdoe

by 1995, we believe the UK will bid aggressively for gas from Norway's Sleipner field to meet its projected import requirement. Sleipner contains an estimated 2 billion boe of recoverable gas reserves and Statoil, the Norwegian national oil company, has decided on a strategy of rapid depletion.

The Norwegians are negotiating with the British and also with other European buyers for the sale of Sleipner gas.

Because of the location of the field, economics dictate that virtually all of the gas from Sleipner be landed either in the UK or on the Continent. Several factors favor the UK:

- Sleipner gas contains a high amount of carbon dioxide, which requires special processing and possibly separate receiving facilities. London has experience with this problem, and several smaller UK gasfields containing carbon dioxide could be linked to a Sleipner system.

- The location of Sleipner is ideal for linkage to the existing Frigg pipeline system, which will have spare capacity of about 330,000 bdoe by 1993. This method of landing Sleipner gas would be about one-fourth as costly as a separate pipeline link to the Continent.

- The United Kingdom imports about 197,000 bdoe of Norwegian gas and considers Norway a desirable and secure supplier. There are now no other viable suppliers to meet projected UK gas demand in the 1990s.

- European buyers are not expected to bid as aggressively as London for Sleipner gas in view of their projected lower gas demand and alternative sources of supply.

The decisive factor in choosing where Sleipner gas is landed will be price. Statoil, operator of Sleipner, probably will demand a price comparable to that received for Statfjord gas (about $3.50 per million Btu at the wellhead), which is substantially higher than the BGC has been paying for most other gas supplies. We believe, however, that the BGC is willing to pay a competitive price for Norwegian gas, since there are now no other viable suppliers and the BGC has not balked at paying competitive prices for Norwegian gas in the past. 25X1 25X1 25X1

A Link to the Continent in the 1990s?

If the UK gets Sleipner gas, as we now expect, and implements policies in the 1980s to encourage new gas development, the need for additional imports in the late 1990s will be minimized. Such policies—including tax concessions for marginal fields, allowing domestic natural gas prices to rise to market levels, and official support for gas exploration and development—will allow domestic production to reach 830,000 to 900,000 bdoe in 1995. If gas demand in 1995 is also in line with current estimates, the UK could then have a small annual gas surplus of about 80,000 to 160,000 bdoe. This, in turn, would reduce UK needs for additional Norwegian gas from new fields under development and raise the possibility of the export of natural gas from the UK to the Continent. 25X1 25X1 25X1

Several major oil companies have indicated that increased UK production would encourage a pipeline link between southern offshore fields in the United Kingdom and the Continent. A pipeline link to the Continent has several attractions:

- Swapping southern UK gas for Norwegian gas imports would lower delivery costs and leadtimes in developing northerly Norwegian fields. 25X1

- An integrated gas market would enhance buyers' negotiating leverage with Norway and increase supply flexibility and energy security in the West European gas market. 25X1 25X1

- A link would allow the United Kingdom to tap gas supplies on the Continent once UK reserves begin to run out.

- Sales of surplus gas to the Continent could net the United Kingdom additional revenues in the 1990s, when we expect UK petroleum revenues to fall sharply. [redacted] 25X1

However, there has been considerable resistance by the BGC and the Energy Ministry to the idea of any gas pipeline link with the Continent. Principal among British concerns is the possibility that UK gas reserves would be depleted rapidly by buyers on the Continent in the event of a gas supply disruption or a surge in continental demand. Domestic opposition to any export of British gas apparently remains strong. Last December, for example, London decided to land the British share of Statfjord gas in the United Kingdom even though it will be far more costly than allowing the gas to flow through the Norwegian pipeline to Emden, West Germany. Additionally, even if domestic production is increased substantially, much uncertainty still remains regarding future gas availability. London is keenly aware of Norwegian opposition to an integration of the continental and UK markets and would be reluctant to jeopardize any potential future supply arrangements with Oslo. Unless these political constraints can be overcome, we do not believe that London will permit a linkage with the continental gas market in the foreseeable future. [redacted] 25X1